




Chelmsford Amateur Radio Society

Newsletter

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Next meeting: 3rd January - 7.30pm, Oaklands Museum

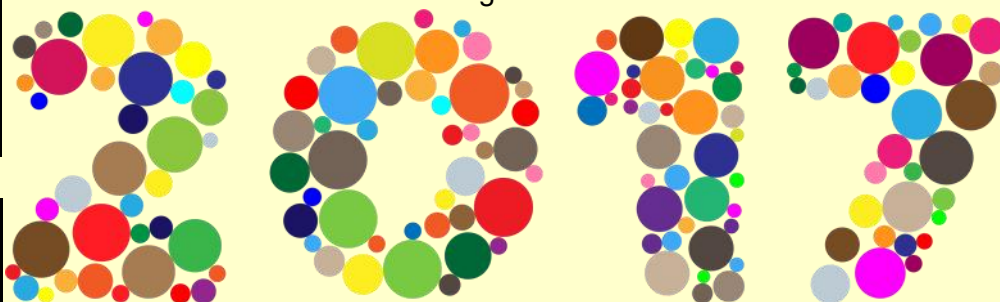
Riding the radio waves - Jane Humphreys OBE

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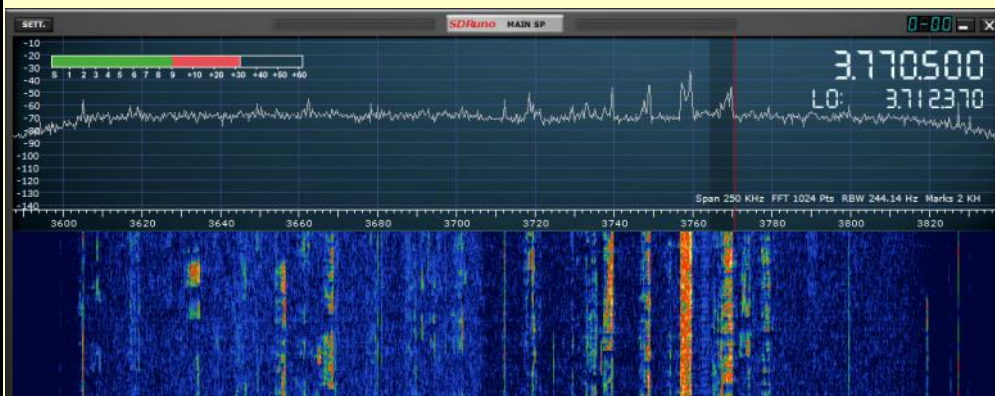
Welcome to the colourful world of Amateur Radio. If you can't see the colour in the rigs above, check out our colour blindness chart below and look again!



Club Nets - Tuesdays 20:00h
Net Controller: TBD

#2 - GB3DA 10th January
#3 - GB3ER 17th January
#4 - 80m 24th January
3.756MHz
#5 - 160m 21st January
1.947MHz

Essex Ham Net
Mondays 20:00h GB3DA



Contact details for the newsletter: editor@g0mwt.org.uk

Editorial

Hello again, and welcome to the latest edition of this newsletter. A happy new Year to all my readers! Yes, I know I do have some, because John, G6JPG emailed me the following:

Your bits on a Sudbury museum reminded me of the one run by the late Gerry Wells – see <http://bvwm.org.uk/>, then click on Virtual Tour. (I sadly haven't been back since Gerry died, as for me he was the museum – certainly its greatest exhibit, and the epitome of the old word "boffin". [Rarely seen as in the picture on the home page; nearly always in a {not very clean!} white coat.]) If anyone's been to the museum since, I'd be interested to know how it is.

Then the CR100. I was privileged to know Dr. George Grisdale, who designed it; in the time I knew him he was an amiable old fellow, who occasionally dropped in at Baddow (in his Morris Minor), where he'd been head of the communications lab. I was told by those who had worked under him that he wasn't always the gentle fellow I knew! Last time he did, I was able to hand over to him a typed early manual I'd found for it in a filing cabinet.

And the article on remotes etc. contained one of my pet hates – "LCD displays". Yes, you can have an LED display, but not an LCD one 😊!

Yes, John. Gerry was mentioned at the meeting and it was apparent that several of the members knew him, and of him, too. Several anecdotes were shared and it seems the museum is still going strong. I decided I should go along the museum and have a look for myself (both of them, in fact!)

Also, I share your disgruntlement at the term "LCD display". That is just one of a few verbal tics I have picked up over the years without knowing I am doing it, along with the nagging tendency to put apostrophe's(!) in places they shouldn't be. One is exposed to misuse of the language so often - especially now that so many use the internet - with social media, forums and emails exposing an appalling standard of literacy that after a while the prevalence tends to diffuse it into your mental processes almost by osmosis. LED's & CD's are (non) favourites but you see it so often that after a while it almost seems right (and, that, of course, is how language changes). The one that most recently came to my notice earlier this year was the prevalence with which everyone seems to preface the answer to a question with "So...". Where did that come from? I have become so sensitised to it, that I have almost found myself doing it. - **Ed**.

Dates for your diary

Please note: the dates may be subject to change...

Tue. 3rd January	Meeting - Riding the radio waves - Jane Humphreys OBE
Mon. 16th January	Skills Night - Danbury Village Hall
Sun. 5th February	Canvey Rally - Paddocks Community Centre, Long Road, SS8 0JA
Tue. 7th February	Meeting - Talk on Diplomatic Wireless - Peter Grimshaw, M0HSG
Mon. 20th February	Skills Night - Danbury Village Hall
Tue. 7th March	Meeting - Classic Computers - Andy Chapman, G7TKK
Mon. 20th March	Skills Night - Danbury Village Hall
Tue. 4th April	Meeting - RF Kits Design & Manufacture - David Powis, G4HUP (hupRF.com)
Mon. 17th April	Skills Night - Danbury Village Hall
Tue. 2nd May	Meeting - Tricks with Coax - John Regnault, G4WSX
Mon. 15th May	Skills Night - Danbury Village Hall
Tue. 6th June	Meeting - Table top sale
Mon. 19th June	Skills Night - Danbury Village Hall
Tue. 1st August	Meeting - Constructor's competition
Tue. 5th September	Meeting - Keith Maton will talk about Radio Caroline

Riding the Radio Waves

Our talk this month is by Jane Humphreys OBE. Jane gave a similar talk at the Hall Street factory site during the 2016 Marconi exhibition. Her CV is given here:

Jane started as Senior Spectrum Advisor in January 2015 having retired from the Civil Service in November 2014. She brings experience of working with users of spectrum spanning more than 30 years to her current role. Her 4 years at Ofcom were in the early days of competition between Vodafone and Cellnet and culminated in 1989 with the beauty contest to select new 2G operators at 1800MHz. After periods working on financial services and the DTI's services in the regions and overseas, she became Deputy Director of the 3G Auction Team based at the Radiocommunications Agency. With the licences successfully granted and paid for, she returned to DTI to lead the broadcasting team and specifically digital TV switchover. She became Head of Spectrum Policy at DCMS in March 2012, in time to play an active role in the 4G auction. The UK Spectrum Strategy which was launched by the Prime Minister in March 2014 capped Jane's Civil Service career.

She is currently "Assisting the UK Spectrum Policy Forum in delivering the UK Spectrum Strategy by working in effective partnership with Government and Ofcom" with techUK (www.techuk.org) which "represents the companies and technologies that are defining today the world that we will live in tomorrow. The tech industry is creating jobs and growth across the UK. In 2015 the internet economy contributed 10% of the UK's GDP. 900 companies are members of techUK. Collectively they employ more than 700,000 members, about half of all tech sector jobs in the UK. These companies range from leading FTSE 100 companies to new innovative start-ups. The majority of our members are small and medium sized businesses."

According to LinkedIn and Companies House, Jane is also sole director of JEH Spectrum Ltd., for whom she provides professional advice on spectrum policy. The company has no obvious web presence.

Jane has asked for any requests for special topics we would like her to cover. She makes no promises, but will try to answer as best she can. Time is obviously limited, so please, if you wish to pose any, then let either me or Colin, G0TRM know and we will pass on the enquiry. Colin can be contacted via g0trm@g0mwt.org.uk and my editorial email address is on the front page of this Newsletter. - **Ed**

The Lost Photo of Apollo15

At the December meeting John, G8DET told the story that early in September 1971 while out for an Engineers mid-day stroll in Central London, he passed a skip being filled with photograph "stuff", including prints from a Photographic Studio shutting down. The three other Engineers with him had a quick dip and continued back to their office. John had chosen superb press photos of Apollo 15 taken on the Moon. Collectively they looked at the quality of the Moon pictures and recognised many from the TV, newspapers and magazines a month or so before. John put his in a large envelope and filed them in a drawer, as you do. He had to change desks a while later and remembers finding them, taking one photo out to show his Wife, Pauline and transferring the rest. He moved offices years later, but does not remember seeing his Moon photos. He thought nothing more of it.

Years later when someone was talking about the Moon he told this story but could not produce any of the photos – which everyone thought was a pity. Two weeks ago he sold all of his film camera equipment on eBay and while looking in the near empty camera crate, found a black folder with cuttings of photography and a brown envelope in which was his "one and only" moon photo, which he showed to the meeting.

He sent a copy to Murray, G6JYB as he knew about the missing photo(s) and he promptly sent back a whole load of internet links which John knew nothing about. Very quickly he found his B&W photo was taken from a colour photo (AS15 88 11866). Also this introduced him to thousands of other "moon" photos. In 2013 NASA seem to have released a tremendous amount of photos and specifications on the Internet but there is no single easy access link – the stuff is often in the most unusual places.

John posed the question - was this photograph taken on the moon or was it a spoof to enhance NASA and to appease Congress and so maintain their \$multi-billion budget - and maybe impress the world as well?

See the 6 photos below which documents that the Americans did go to the Moon and used Rovers on Apollo 15, 16 and 17 that are still on the Moon.

<http://www.skyandtelescope.com/observing/how-to-see-all-six-apollo-moon-landing-sites/> and <http://www.jodrellbank.net/20-july-1969-lovell-telescope-tracked-eagle-lander-onto-surface-moon/>

Thanks to an associate of CARS for providing these two links. Click on Apollo 15 to follow the story.

John, G8DET

I had an interesting email chat with John about this after him showing his picture at the event. John's contention that a series of publicity pictures were taken in studio conditions is echoed elsewhere on the internet for a variety of reasons. I don't buy any of these conspiracy theories, but it has to be said that some of them are pretty clever. John also went on to say that by coincidence he watched a wonderful TV program on PDS America channel about the Hubble telescope and they spent quite a few minutes showing Congress debating whether to spend more money to correct the faulty lens – there were people in power who were violently against spending a penny more – they even thought putting the thing up there was a tremendous waste of taxpayers' money to start with – they were really going on about it. John didn't want me to publish his picture but it is apparently public domain, so a small image of the original John mentioned is below.

I have to say that I thoroughly get every instance of the space program—be it satellites, interplanetary probes, landers, or solar research, but I sometimes find myself a little saddened that I won't be around to see the real scientific discoveries and any real benefits that will be part of the next generation's future and the generations coming after them. - Ed.



The moon again—the long way round

When I took my Morse test in May 1977 I had to go to London to do so. It was the usual nerve inducing affair and there were about half a dozen of us taking the test. One of the guys was doubly nervy and he was talking twenty to the dozen. He got the text down but was seemingly unable to discern any spaces in the sent material. The examiner just shrugged and said that as long as the characters were recorded sufficiently accurately, that would do for him. As I recall, we all passed, but the point of this piece is the text the examiner used. I think I remember the starting words: "The moon in all her splendour shone silver on the lake" and whilst I was corresponding with John, I looked to see if our friend Google could find "the moon in all her splendour" and the rest of the text I was sent. I'm not sure if it did or not. Two or three passages came up time and again and referred to some sort of witchcraft. Amongst a few of the rarer likely ones was this, taken from "Algeria: The topography and history, political, social and natural of French Africa".

The following night-scene described by Baron Baude, on his trip from Bona to La Calle, gives a good idea of the poetry of Arab life: "The moon in all her splendour silvered the surface of the lake, and its light was mixed under our black tent with the glare of the fire of dry rushes.

Above the heads of the crouching Arabs stretched out those of the Numidian horses, the faithful companions, who seemed to take part in their recreations. The animated faces of our hosts, as attentive to the story being told as to the roast mutton, seemed lighted up with the departed elegance of their race; and we, the descendants of those barbarians who learnt civilisation from them, were almost envious of their present condition."

It's too long ago now to remember any more and it's not likely to have been the words used at the time, but I can't be sure. Anyway; one of the sources of this reference was www.forgottenbooks.com and the other was archive.org. The former boasts a superb library of just what the title might suggest; such gems as "The Engineer's Sketch-Book of Mechanical Movements, Devices, Appliances, Contrivances and Details" "The Telephone System of the British Post Office—a Practical Handbook" and "The Inventions, Researches and Writings of Nikola Tesla" (With Special Reference to His Work in Polyphase Currents and High Potential Lighting). Although all titles must ostensibly be paid for you can download the bulk of the pages for free; some pages being blocked with advertising material. The latter is a Wikipedia like free archive of anything including modern titles, as long as it is free of copyright. The content ranges from books to video through audio recordings, music and image libraries. Links are there to various collections around the world and the more enlightened American and Canadian public library system. Links can also be found to websites and there are many stored books and other works on amateur radio, antennas and propagation to name but a few.

And, yes, John, we finally come full circle. They do have a lot of NASA moon stuff on there - including audio recordings of the Apollo missions, amongst others.

How about using the moon to find true North? Look here to find out how: <http://w3yy.com/truenorth.htm>

One of the things I spotted was an archive search engine called the Wayback Machine. It is an internet **history** browser and just for fun I entered the title of my web page as it used to be when I first activated it: www.sawfly.net. You won't find it now, but the way back machine saved the pages 10 times between [May 12, 2004](#) and [April 9, 2005](#). I was into model flying in those days and I was pleased to see that work I did on a model called the [Bowden Mouse](#) was still around. It was an aircraft originally designed in 1934 for small petrol engines that I modernised, electrified and fitted with radio control around the turn of the millennium. I did a lot of aerodynamic analysis work on it and was rather pleased with the results.



I used a program called CHAM and in those days you could get their shareware fluid dynamics simulator for free. Their website is also archived but I'll bet none of the shareware download links work now!

It's things like this and other diversions that makes editing this Newsletter such a lengthy business sometimes. - **Ed**.



December Social Meeting

There's always one, isn't there?



And quite right, too. Where would we be without the fun?

This month's meeting followed the standard formula of chai, chat and chewing - the latter being exercised around John Bowen's choice of mince pies, stollen and shortbread; this was supplemented by Anne Salmon's choice of biscuits to go along with her tea and coffee.

Tony, G4YTG was again on hand diddling on his organ (very expensive, from a charity shop) and the evening brought out all sorts of members we often only see on these and similar occasions.

We were lucky to have Keith Haynes, G3WRO and Vic Rogers, G6BHE along for a quick chat. I'll let Keith tell it in his own words:

Hi there. On 6th December I spent a most enjoyable evening at Oaklands Museum for the CARS Christmas social evening. During the evening I gave a short presentation on matters concerning Region 12 and for the benefit of some members who were not present your editor felt it would be a good idea to briefly go over the relevant points for your Newsletter.

Back in June 2015 at the Hamfest in Friedrichshafen I spoke with Steve Thomas (M1ACB) the then Regional Manager for Region 12, about my willingness to volunteer in some way for the RSGB. It just so happened that the Deputy Regional Manager's post for Essex was available and Steve appointed me, and as Essex is particularly highly populated with radio amateurs and Clubs the role was split into two and the other appointee was Vic Rogers (G6BHE). Vic agreed to cover south & east Essex, and I agreed to cover north & west Essex. Due to other commitments I was unable to fulfill the role until the beginning of this year, and then of course in April Steve was appointed the General Manager of the RSGB. As a result Steve asked me if I would consider taking on the role of Region 12 Manager, and lacking the experience my first reaction was no, but nevertheless after some thought I agreed to take it on albeit on my own admission I have (and still have) a lot to learn about everything the Society has to offer!

Going forward, please be assured that I have every faith in Vic Rogers as your Deputy Regional Manager. CARS falls within his scope and I am sure he will maintain a close working relationship with you all. Incidentally, the new Deputy Regional Manager for north & west Essex appointed by me in June is Peter Onion (G0DZB). Please give Vic your wholehearted support. All of the DRM's have to produce a quarterly report to their respective Regional Managers which in turn are reviewed by the Regional Council Meetings held every quarter in Kegworth. Monthly meetings are held on Skype.

My mandate from the Society is to ensure that all affiliated Clubs have a good relationship with the RSGB and that can be maintained primarily with Vic as your DRM. I would like to assure you also of my express desire to ensure that as the national Society we support you as individuals and a Club and to that end I look forward to networking with you at the major events in our county.

If I personally can be of any assistance to any of you please do not hesitate to let me know. You can reach me at:- rm12@rsgb.org.uk

Keith Haynes, G3WRO Regional Manager RSGB (Region 12)





Thanks Keith. Nice of you to send in that precis.

Murray posed his usual brand of colourful quiz and cryptic questions (is that cq and cq?) I have to say that they all had me stumped, but that's par for the course in my case.



2016 CARS Xmas Quiz

Q3: What frequency band might NORAD track Santa by radar ?

© Chelmsford Amateur Radio Society 2016 CARS Xmas 4

We all adjourned for chai and chat and then returned for Chris, G0IPU to give us his run down on the club's year to date with his PP presentation.

2016 CARS Xmas Quiz

Q9: What is the QTH Locator Prefix for the North Pole?

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The raffle was drawn and the prizes were plentiful. As is quite usual, several people had multiple tickets drawn but if you think about it, with the probability of a) pretty much everyone there buying at least one ticket and b) several buying (say) a strip of five, then it is possible there will be more tickets than attendees so what is the probability of it occurring? Dunno; that was one of the many areas that confused the hell out of me whenever I had to deal with it in any formal education situation.

Paul, G7BHE seemed pleased this time with his book choice. He and Chris had slightly less concern showing on their faces when Pete, M0PSX snapped them (thanks, for the pictures).



I plumped for the huge bottle of wine and Les, G4JDS seemed happy with his ATU. Dorothy, M0LMR obviously couldn't get enough of John's mince pies and felt the need to take some home with her! Another pleasant evening. - Ed.



CARS Training in 2017

Firstly the news that CARS Training finished 2016 on Monday Dec 5th with exam passes for Steve, who is now M0UEH and Martin (pictured) who is now M6IFC – our congratulations to both.

In 2017, CARS will be entering the 15th Year of the current Foundation courses which is a pretty remarkable milestone. Our first course started on 10th January 2002 and our 35th Foundation Course starts on 19th January 2017.

As you might expect demand has tailed off somewhat, but nothing like as quick as we first imagined it would back in 2002. However there are more clubs and courses around so for 2017 we have adjusted the calendar to some extent and below is the current plan. As usual, CARS will be running these at Danbury Village Hall from 7-9pm on Thursdays.



Foundation

For those undertaking Foundation one option to improve your chances is to also undertake the [online course](#) that Peter M0PSX runs, as that can get you up to speed for the full package at CARS where we also provide the practicals and exam itself.

Course No	Course Dates	Exam Date
35	19-Jan-2017 to 16-Feb-2017	23-Feb-2017
36	Autumn-2017	tbc

Intermediate

Intermediate also is on Thursday evenings and the full course is below.

Course No	Course Dates	Exam Date
16	23-Mar-2017 to 1-Jun-2017	8-Jun-2017

For Advance this year, unless demand arises, we are only running Exam sessions rather than revision courses. The two exam dates are now on Thursday evenings, like our other courses, and are aligned with the popular Bath distance-learning course run by Steve Hartley, G0FUW.

Advance

Note that for Advance exams in particular there is a strict 4-week notice of registration and payment required by the RSGB, so please ensure you notify us of your interest well before that deadline.

Course No	Course Dates	Exam Date
19E	Exam-only	Thu 6-Jul-2017
20E	Exam-only	Thu 7-Dec-2017

Practicals and Exam retakes

The Advance sessions in particular are open to being used for retakes of other exams (even if you undertook the original course at another club). Upon request, we can also accommodate those interested in taking Practicals-only, in parallel to the appropriate courses above.

Morse Classes

Our popular Morse classes are being run by Andy Kersey G0IBN in parallel, and in the first half of the year will run on Thursday evenings from January 19th to June 8th

Further Information

The CARS training webpage has all the information as well as links to course material and PayPal for online payment of fees... <http://www.g0mwt.org.uk/training>

For training courses contact Chris Chapman, G0IPU: training2017@g0mwt.org.uk

For Morse classes contact Andrew Kersey, G0IBN: morse@g0mwt.org.uk

Murray, G6JYB

Morse code is on its way out?

If you think Morse code is on its way out you should have been on the bands over the weekend of November 26th and 27th, 2016, when the American CQ Magazine had its annual World Wide CW contest. The CW segments were wall to wall with CW operators - even with the narrowest filter switched into your radio there could be two stations operating. Many operated from their home, others operated in obscure places.

You do not have to be a contest operator to participate in this, or any other contest. It is an ideal time to check your aerial system, especially if you are a QRP operator. Today's rigs will send your callsign automatically with a touch of a button.

1. Read the details of the contest on SM3CER's contest page (<http://www.sk3bg.se/contest/>).
2. Set your rig so that with the push of a button you can send your callsign.
3. Take your time and pick out a callsign you can read - some are so fast and often unreadable.
4. When the contest operator pauses send your callsign.
5. You will expect a reply of "2E0XXX 5nn 142" 142 being his next serial number, or "5nn 28" 28 being his CQ zone.
6. You will reply "5nn 006", 006 being your next serial number, or "5nn 14" your CQ zone.

Try and get into the habit of using a contest program; there are lots to choose from on the web. I use N1MM Logger+ <http://n1mm.hamdocs.com/tiki-index.php>, a free, well known and tested contest program, but like any program it does take time to get used to it. If you have problems, then please ask and I will do my best to help. These contest programs do all the work for you, you just have to be able to read and input the callsign to the pc.

CQWWCW can be a team contest or you can operate on your own from home. This contest has a duration of 48 hours. I cannot stay awake for 48 hours(!), so I operate on one band, 20m, which is generally open in daylight hours. From 8am to around 5pm I searched up and down the bands, pouncing on the DX stations, having breaks for exercise and meals.

With the callsign G4C, I operated with 100 watts, a 2 element Hybrid Beam and my ICOM 7700.

Some take abbreviation in Morse code to the extreme, 5NN for 599 being the norm. One station transmitted his CQ Zone of 15 as dit dah, for the figure 1, and dit for the 5, taking minimisation to the extreme!

I decided to stop when I had obtained 100,000 points - then I noticed I had 480 contacts. To round things off I decided to make it to 500 contacts. The final score was 112,574 points, 506 contacts, 91 countries in 28 zones.

DX was in abundance. The furthest contact was VK2, 10.5K miles. KH0 Mariana island, 7.5K, Rodriguez Island 6K miles. To mention just a few others: China, Thailand, Korea, Japan, Laos in Cambodia, Puerto Rica, Malaysia, Argentina, Venezuela, Beijing, Brazil, Aruba, Honduras, Mayotte, Maldives.

If you would like to become proficient in Morse code, come and join our Morse classes in Danbury on a Thursday evening, starting at 7p.m.

Morse Classes - Note the date change!

Thursday 19th January, 2017, Danbury Village Hall, 7p.m. *PUT IT IN YOUR DIARY NOW!*

Our friendly classes enjoy an evening of Morse code, from the complete beginner to the operator who just wants to improve his skills.

In eight weeks - if you do your homework - we will cover all the letters, figures and characters used to enable you to get on the CW portion of the bands. Bring your Morse key if you have one, a pen and an A4 sized book.

See the Chelmsford Amateur Radio Society web page - you do not have to be a CARS member.

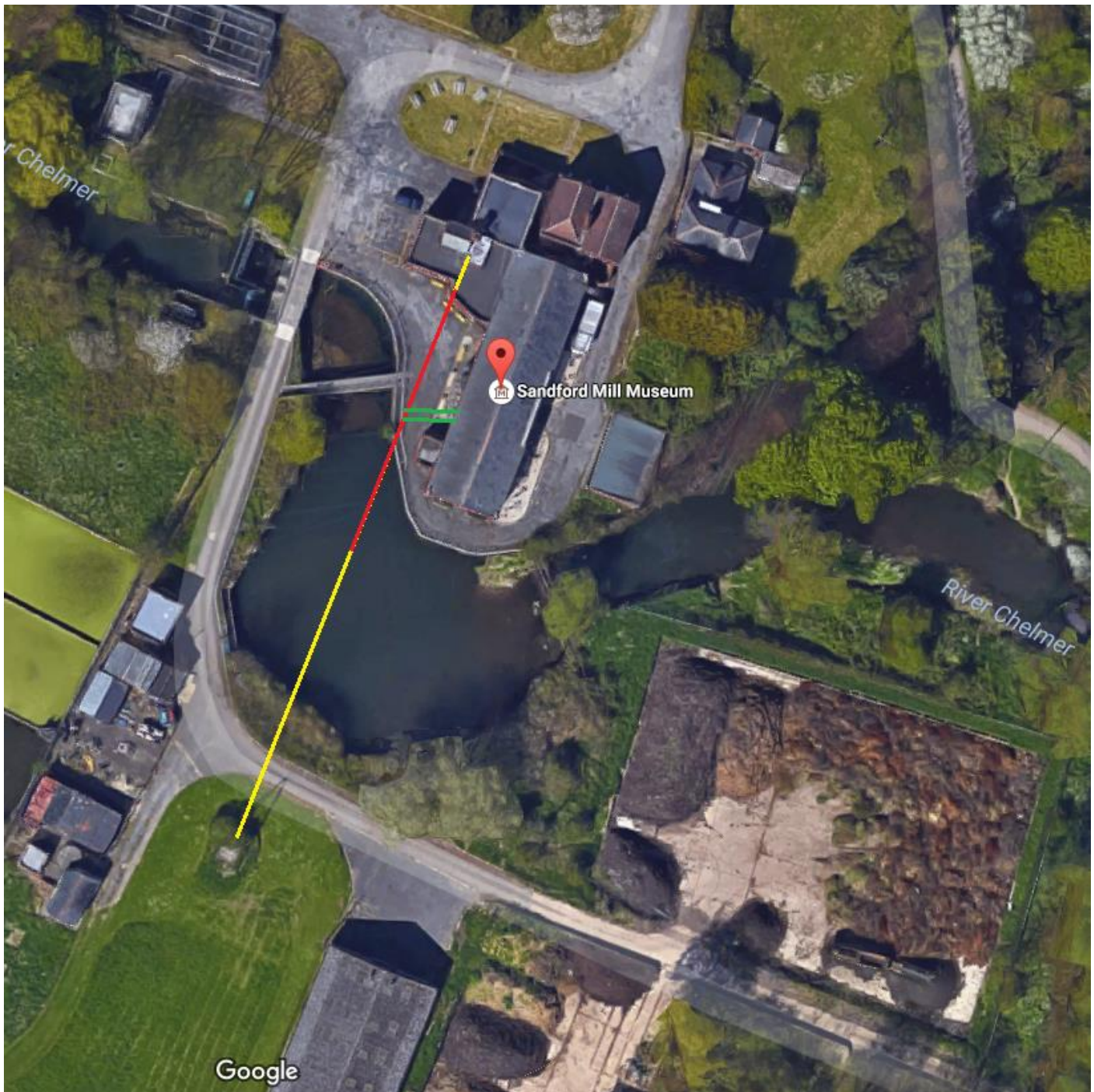
Andrew Kersey, G0IBN (QTHr - Details on qrz.com)

Doublet antenna matching. Effective? Sensible?

Last month I talked about the fallacy of accepting a poor feeder match by tuning it out with an ATU at the shack end. One of the oldest and most popular antenna systems is the doublet, or dipole which is characterised by two radiating elements (usually wire) that is usually, but not exclusively fed somewhere between $\frac{1}{3}$ and $\frac{1}{2}$ of its length. The feed impedance varies according to frequency and whereabouts on the wire the feed point is. Any feeder connected to the antenna is therefore going to be compromised if the antenna is used for multiband operation. That said, however, it remains a very popular antenna and there are as many varieties and versions out there as there are points of view on the subject.

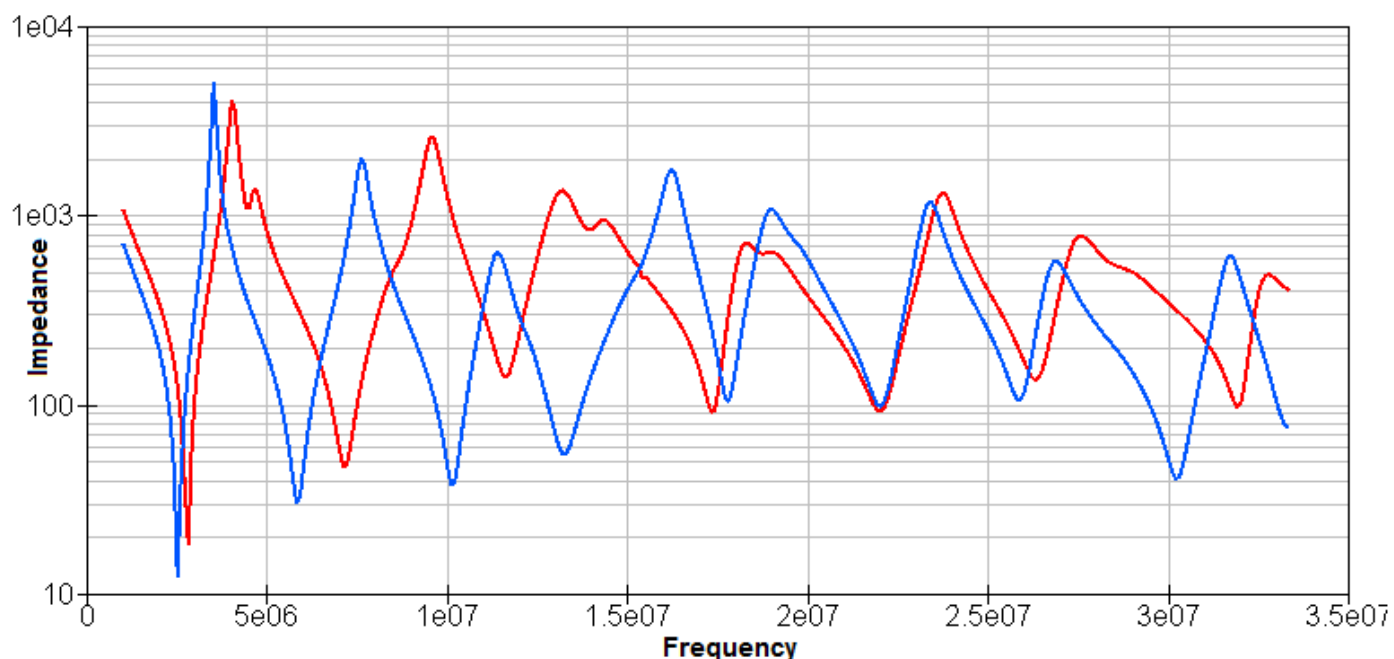
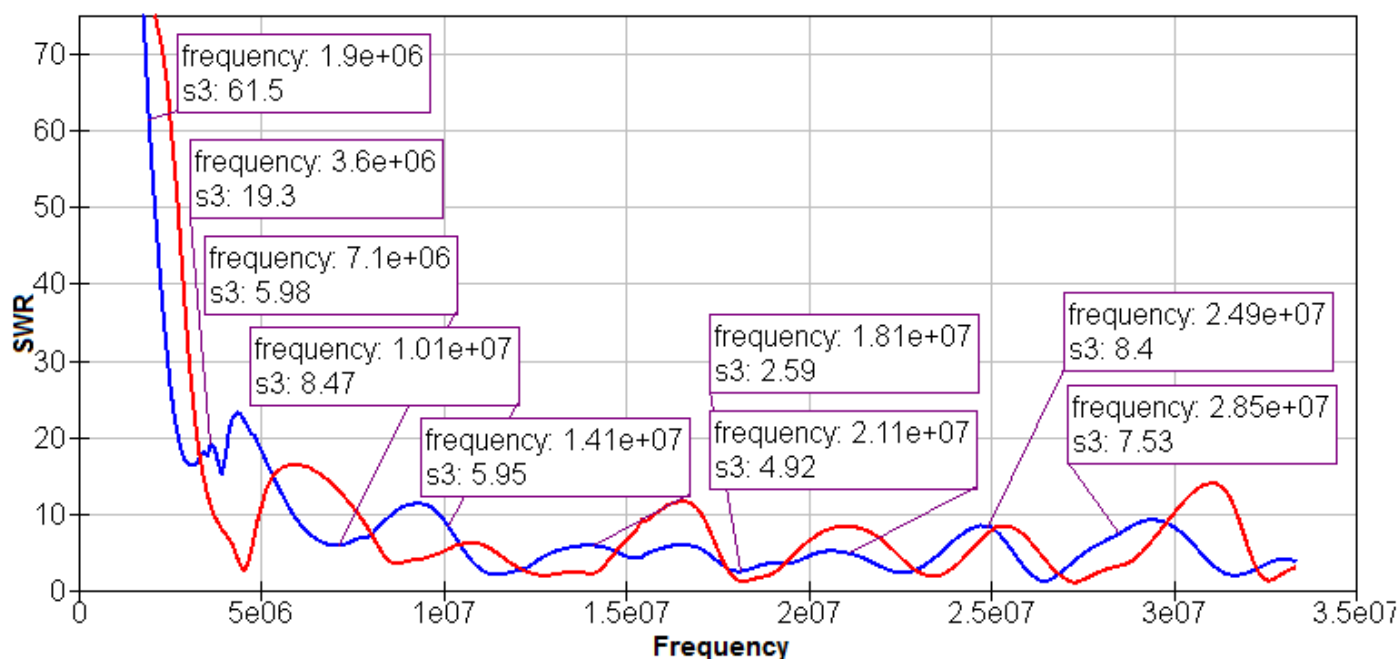
There has been a long standing tradition in the Society of operating from Sandford Mill with its long doublet. I'm going to use this as an example, not only because I had access to it and was able to measure the characteristics, but because it demonstrates some of the points referred to. This article may get techy...

Sandford Mill plan with antenna run (from Google Maps)



The antenna runs in part over water, ground and close to the museum building. The approximate run is shown with the non-conducting supports in yellow and the antenna proper in red. It is suspended by leaders running from metal poles on top of the building and then out past the River Chelmer to an old deep water well supporting structure. Its height at the ends has been suggested to me as 45'. The feeder is a home brew wide-spaced (600Ω?) twin wire (shown in green) that runs down from the centre of the antenna to a doorway of the museum where it is fed through the door frame in insulated tubes. From there, a 300Ω ribbon feeder is attached which goes to the centre support of the "Marconi hut" from where CARS operates.

The red traces in the graphs below show the SWR and impedance of the 600Ω feeder where it enters the doorframe and the blue traces represent the ATU end of the 300Ω ribbon which joins the 600Ω feeder. The SWR graphs have been referred to the relevant feeder impedance, not 50Ω. The SWR as seen by each relevant section of feeder is different to the SWR as seen and measured by the test equipment, which is referred to 50Ω. It would have been possible for me to have changed the instrument's reference impedance but that transformation is carried out in software and it is just as easy to post-process it.

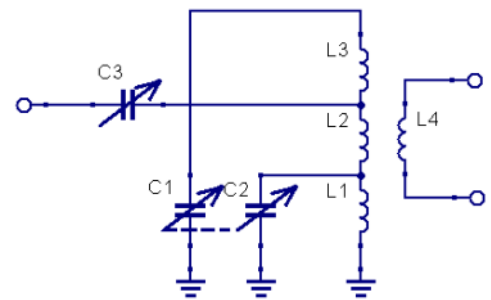


The frequency markers show sample band operating frequencies and corresponding SWRs. My apologies for the naff display, but good though the open source QUCS simulator is, it sorely lacks some of the more basic formatting niceties (and any meaningful help files, for that matter!) The graph shows that although it is generally accepted that an open or ribbon feeder suffers less mismatch loss than a coax, any SWR on that respective feeder will still translate to some loss in the manner observed in the previous article.

The Sandford Mill antenna has had very good credentials and a reputation amongst older members for being one of the best in the country and which operators apparently queued up to use—often during 24 hour stints when conditions and enthusiasm were different to those of today. I talked to Brian, G3CVI about its history and design as he was one of those responsible for erecting it. Brian gives the length as “something more than $\lambda/2$ on 80m”.

Although the principle dates back to the dawn of amateur radio when it was about the simplest you could use without having to resort to beams, this one is not quite that old! Several members, (Brian, Tony, G4YTG and John, G8DET amongst them) referred to a particular MFJ ATU that was always used successfully in the past by CARS. The ATU most often used recently is the club's Palstar, which apparently was acquired to increase the power handling capability but which, even though it could be set to give a low SWR, doesn't seem to allow the club's rig to operate into that match. It seemed wrong that one particular (and industry-standard) ATU should have to be used to match the feeder and after a couple of occasions where the performance had been criticised or the antenna had proved difficult to match, questions were asked in the House (well, in Committee, anyway). I decided to measure it to see what gives. Hence the preceding graphs.

In the early days, the Z match was popular. L1-3 represent a single tapped coil and L4 represents an overwound coil, usually loosely coupled to the main inductor that feeds the feeder. This would historically be a twin feeder, but it could also feed coax by grounding one terminal. Although C1 & C2 are shown ganged, an element of flexibility (and presumably operating difficulty) could be introduced by having individual capacitors. I can think of no technical or engineering reason why this should have gained the popular ubiquity that it did, but the fact that it is almost only available in home-brew format these days suggests ATU manufacturers think likewise.



There don't appear to be any design equations that I could see, although there are plenty of papers analysing the “standard” configuration. I modelled a typical design I found on the net and the results were, frankly, disappointing. The available tuning range was extremely limited and loading the output with a range of resistive impedances resulted in significant difficulty in matching them with any reliability. Throw in the added factor of either capacitive and/or inductive reactance and that just compounds the problem. I am well aware that the model I used will not represent the myriad range of home brew implementations and variations on the same theme, but as I've said before in these pages, if you don't have a sound theoretical or mathematical starting point, then it's just luck and/or guesswork from there on in.

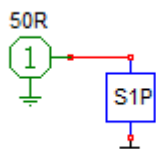
That might sound like a negative viewpoint, but my background is an industry where you can't just chuck a handful of components at a board, solder them where they land and see if it will do the job. It just doesn't work like that in the engineering world. I have come across a few websites that more or less mirror my views, but there are many more out there who enthuse over the variations and modifications to the original Z-match design, so you can form your own opinions. Anyway, back to the antenna/feeder:

If I wanted to match a defined impedance, I would use standard formulae to do so. The match would be in the form of a high-pass or low-pass circuit and would usually only require two components. I have used a variety of very powerful and effective tools over the years but several years ago I happened upon a simple freeware simulation program that would almost fit on a floppy disk (remember them?) and was a very useful tool indeed, incorporating as it did, a suite of other bolt-on goodies. It was called RFSim99 and is dated by its name. It is not so happy on more recent Windows operating systems; it just about copes with Windows 10 (although it won't self-install) whilst it suffers only a few minor quirks on Windows 7. I will use that tool to illustrate a few points as it is simple, very easy to use and still available.

At the outset, I want to say that this section contains some sweeping generalisations and simplifications. Strays, parasitics and losses may be mentioned, but ignored. Impedances are assumed to be stable and/or ideal. If I didn't do this, it would rapidly become unwieldy, unmanageable and unsuitable for this rag.

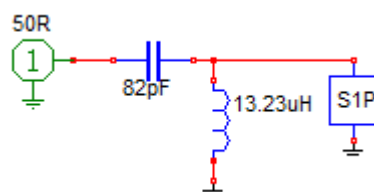
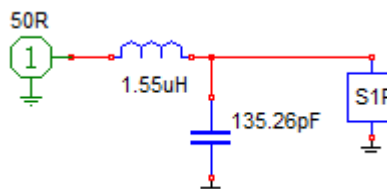
I want to match parameters shown in the box on the right: This is a single frequency measured at 20m on the 300Ω feeder and a match to 50Ω is required.

$F_q = 14.100 \text{ MHz}$
 $\text{SWR} = 9.25$
 $\text{Return loss} = 1.89 \text{ dB}$
 $Z = 64.0 + j152.9 \text{ Ohm}$
 $|Z| = 165.7 \text{ Ohm}$
 $\text{Phase} = 67.3^\circ$
 $L = 1726 \text{ nH}$
 $Z_{\text{par}} = 428.9 + j179.7 \text{ Ohm}$
 $L_{\text{par}} = 2029 \text{ nH}$



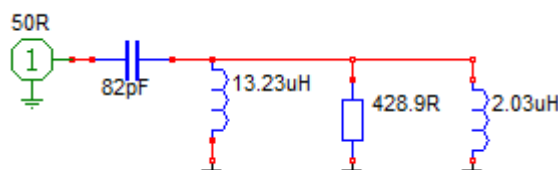
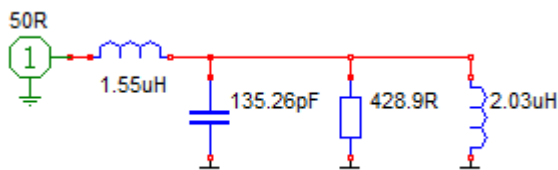
The diagram here (left) is used to represent the impedance. The symbol (1) represents the transmit port and the S1P box is a PC file containing the antenna impedance measurements.

The circuit, right, shows the low pass components used to match that impedance.



Immediately below is the same load impedance but matched with a high pass network. It is just as simple. The component values used are entirely manageable and well within the range of an ATU but both are L matches, whereas virtually all ATUs out there now are T match configuration. Also, the match represents a single-ended network and our feeder is balanced.

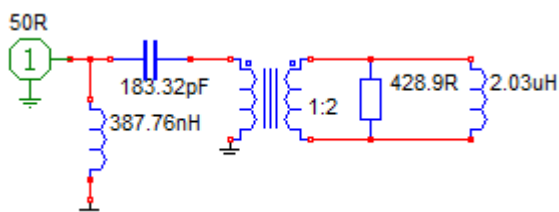
Now we will replace the feeder impedance with the equivalent components at the frequency in question:



Just about every ATU on sale will have a standard balun incorporated to match a balanced feeder. With very few exceptions, that will be standard 2:1 voltage balun with a 4:1 impedance transform, so the new design impedance will become 200Ω. Not a million miles from the 300 ribbon feeder impedance, still a way off the measured impedance, but hopefully able to cope with the load.

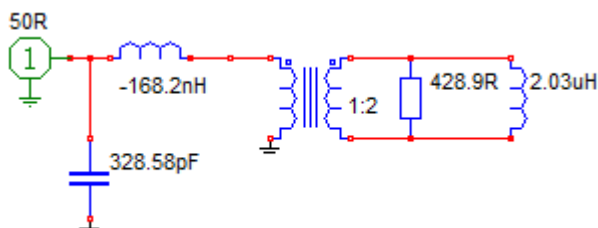
We can now revisit the network required to match the feeder with the balun in place. The impedance referred to the 200Ω balun output is shown in the box.

$F_q = 14.100 \text{ MHz}$
 $\text{SWR} = 5.07$
 $\text{Return loss} = 3.47 \text{ dB}$
 $Z = 64.0 + j152.9 \text{ Ohm}$
 $|Z| = 165.7 \text{ Ohm}$
 $\text{Phase} = 67.3^\circ$
 $L = 1726 \text{ nH}$
 $Z_{\text{par}} = 428.9 + j179.7 \text{ Ohm}$
 $L_{\text{par}} = 2029 \text{ nH}$

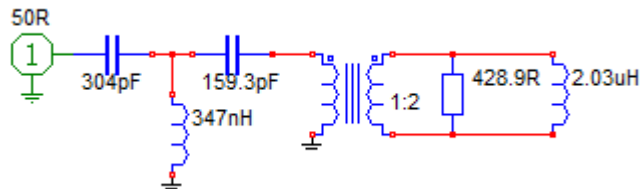


Only the SWR and return loss change with respect to 200Ω. It is 5.09:1. Also, as the transformer is perfect, the SWR seen at the input (50Ω side) **is still** 5.09:1. Magic, eh?

The circuit top left is a valid high pass network. The component values and relative circuit positioning have changed quite a bit. The match is still manageable.



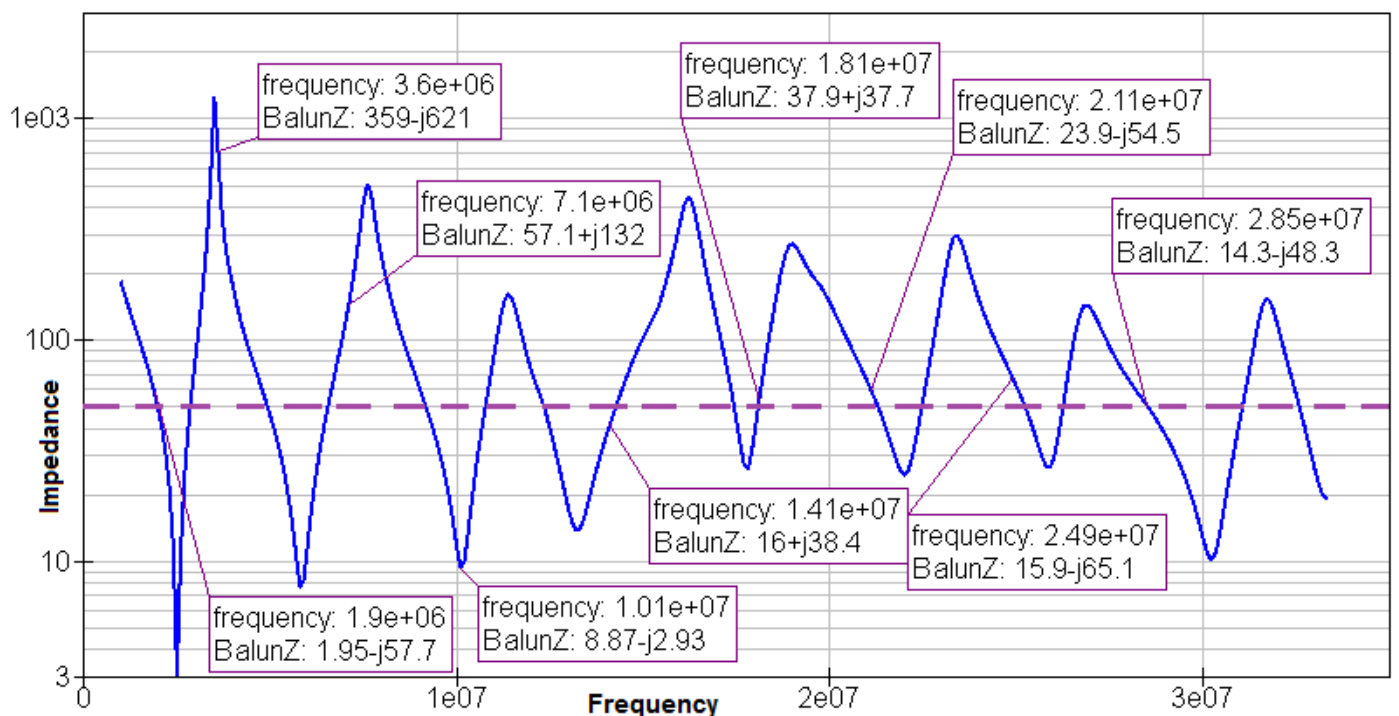
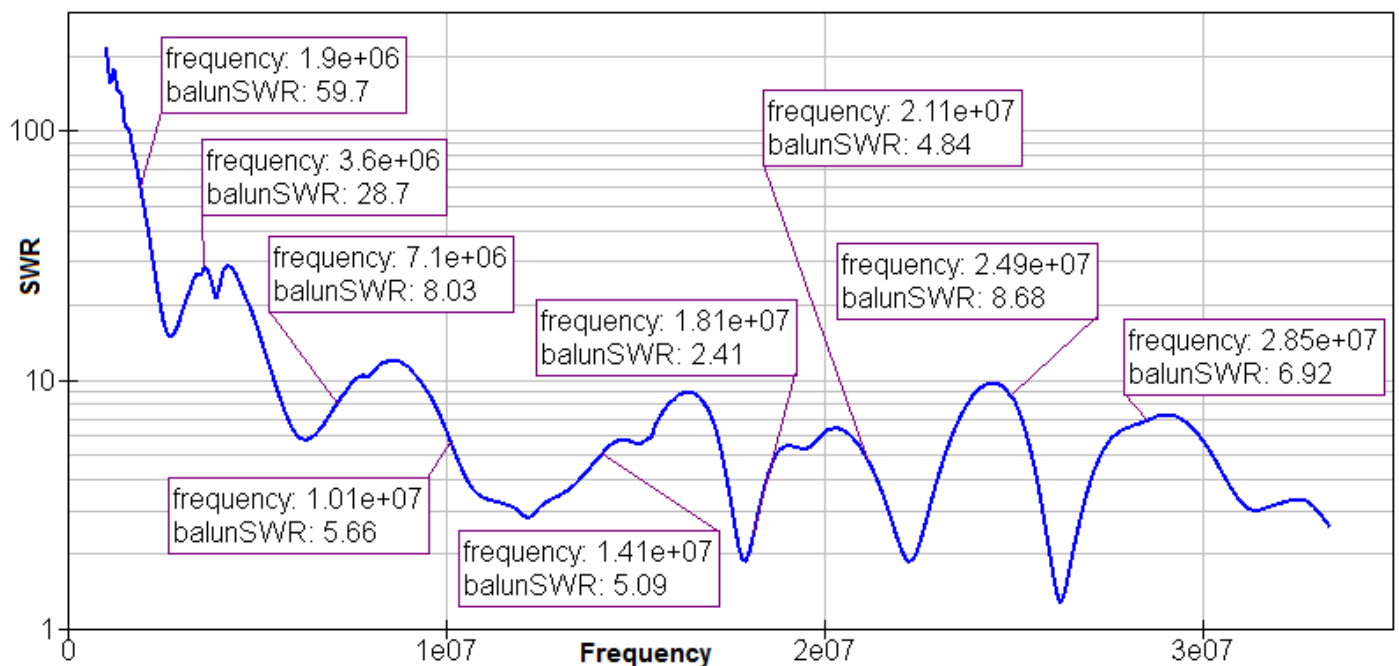
The circuit bottom left is calculated for low pass, but you can see that the inductor is a negative value. This is obviously an invalid solution and demonstrates that there is a limit to the range of impedances that can be addressed with this balun and an L match. Remember though, that most ATUs have a T match high pass configuration with the inductance returned to ground.



The diagram on the left shows the optimum values when a T match ATU network is employed with the balun. So far, so good. And still fairly simple.

Again, it should be said that this is only satisfying the Tx. There is still a mismatch on the 300Ω feeder and

again between the two lengths of feeder at the 300Ω and 600Ω junction so we still have the mismatch loss and high voltages on the feeder to deal with. Recent operating experiences showed that there may have been very high local fields at the operating station at the Mill and this may have been the cause of the transmit problems that were experienced. So: have we solved all the problems by using the balun in the ATU? Nope. Below are plots of the SWRs and impedances at the balun input (50Ω side) that are still to be ironed out. So often you hear people say about a balanced feeder "just put a balun on it". It is not a universal panacea. There are times when it can make a problem worse. In this case, the jury's out.



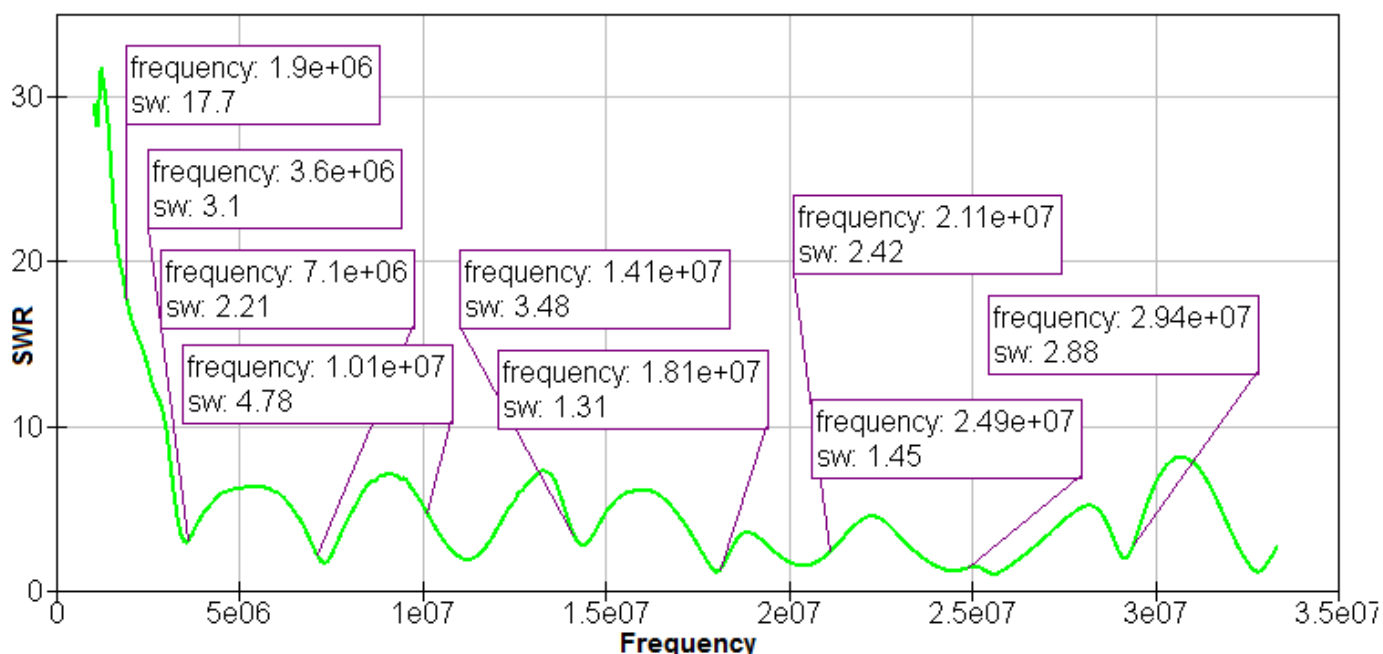
As far as the ATU's internals are concerned, it has to do a lot less work and the T match should be able to cope, but it must be borne in mind that this is a hypothetical situation on one antenna at one frequency. It takes no account whatsoever of an imperfect balun with its strays and leakage inductance.

As it happens, the double ribbon feeder at Sandford Mill has now been supplemented with a remote ATU at the end of the 600Ω feeder. This is a standard SG-231 that will be able to configure the match in an L configuration. The advantage of this is that there are fewer combinations of components to juggle in arriving at a solution. Technically, it's not an ideal solution as it has an unbalanced output, but it's much quicker to tune, reduces losses and avoids the cut and try of a manual tuner. The 300Ω ribbon is still extant, so it can be reconnected and used if anyone should feel the need.

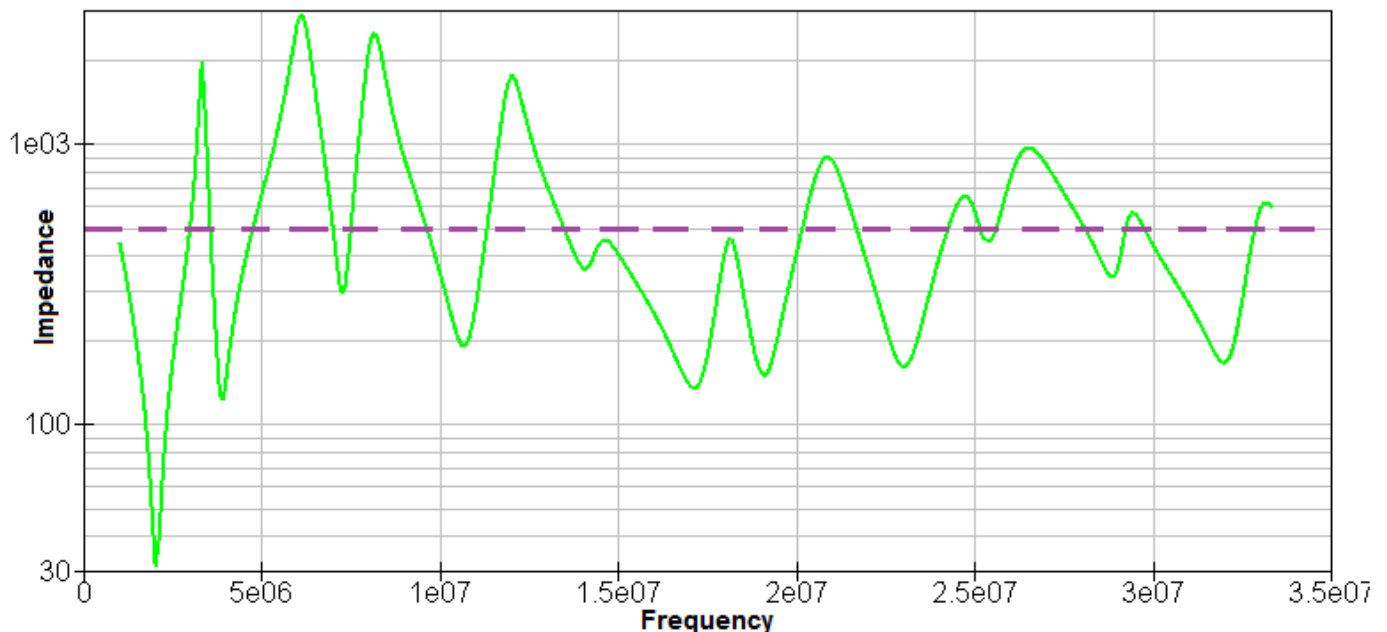
Is this wideband SWR/impedance matching problem applicable to all antennas? Yes, it is, whether long wire or balanced. It means that any design such as the G5RV, or any other doublet fed by any type of feeder will suffer from the same problem although balanced is better than coax, by far. That said, I talked to someone at a Skills night recently and he told me he gets a 1:1 match on his half size G5RV on all the upper bands, despite the fact that it is situated in a non-ideal location and it runs close to a building. His ATU is inside the shack and, as far as he is concerned, everything is hunky-dory; he gets out OK. He also claims to get a lot less noise pickup in central Basildon than I do in Chelmsford. If that is the case, then he is very lucky indeed or my vertical and Windom antennas are just not suited to the task in my location.

Out there in 'netroland, there are people who get it. One such example is W0BTU whose website carries a critique of the G5RV: http://www.w0btu.com/g5rv_antenna.html and offers ideas for improvements made both by himself and others. That said, though, the plots offered are of a theoretical model and that is certainly not foolproof. As an aside, when I first measured the Sandford doublet, I had no idea of its dimensions so I guessed some parameters and estimated the rest. By using the antenna modelling software's optimiser, I eventually came up with a model that wasn't a million miles from both the impedance measurements I made and the real physical dimensions. In fact the similarity was so good it told me that what I was measuring was real. There never is going to be a perfect correlation as the model is perfect and not capable of representing the fact that one end is near a building and over ground whilst the other is more open and over water (as seen in the picture). I'm also guessing at the main "600Ω" feeder impedance.

Now let's see the matching problems discussed above applied (but simplified) elsewhere: My 40.2m long Windom is suspended about 8m off the ground from a pole at the end of the garden and the roof support at the other end is about the same height. The point at which the antenna is tapped to the single wire feed is measured at 5.3m above ground. This is due to the natural wire sag, the pull of the feed wire and the lie of the land. The 500Ω SWR of its **single wire** feeder with respect to earth is shown below.



That's not a misprint. It is generally accepted that a single wire feeder has an impedance of about 500Ω , so if I was to change the simulator's system impedance to 50Ω and re-plot, you would see a much greater calculated SWR. As stated earlier, viewing the feeder mismatch from the feeder impedance viewpoint is necessary in order to get the correct picture of how the system should operate correctly. The impedance is matched by the remote ATU, which doesn't particularly care about what is connected to it; as far as the ATU is concerned, the impedance it sees is a) unbalanced, which suits the configuration and b) as long as it's within its matching capability on the bands in question, that's fine. If it can't match it, that's tough.



Modelling the Windom and feeder configuration shows that 500Ω is indeed about right for the single wire feed. It's not going to make any difference to the antenna's radiation pattern or efficiency although it will radiate in its own right and probably change the pattern by vector addition. It is about right to minimise the theoretical energy and voltage reflected back to the ATU. It is serendipitous that the SWR minima occur mostly where they are required. I could get out there and trim the length and/or feed point to optimise, it although freedom to do so is restricted by the position of the various elements of support, ATU mounting position and wire/feeder routing, but it won't help the local noise QRM. The wire is only the length it is because that is the most I can erect in a straight line.

Am I better off than using a doublet? Dunno. The antenna seems effective in practice, the Windom is easier on the eye and I have the advantage of the remote ATU. If I didn't have that, then a doublet antenna may be a better bet if I could arrange it to put the low impedance points in the centre of the bands I wished to work. I know that is not easy to order. Terrain, soil structure and conductivity, proximity to any objects, foliage and height constraints all conspire to work against you when looking for the right solution. Everyone has preferences, but I'll stick with what I have.

To round this off, I was in conversation with Tony, G4YTG about my treatment of return loss in last month's article. I phrased it wrongly and should clarify that:

- Return loss used as a measure of SWR refers to the amount of power reflected due to mismatch (i.e. return loss due to mismatch for 3:1 SWR = 6dB). The better the match, the greater the RL. A perfect match would give infinite return loss.
- Cable return loss is due to the loss of the feeder itself. The RL for a lossy cable with an infinite impedance mismatch will be twice the cable loss (half the signal is lost on the way down and half on the way back). For example: 30m of cable with a loss of 0.1dB/m and an open circuit load will have a return loss of 6dB (i.e. it will coincidentally look like an SWR of 3:1 on a lossless cable).
- Mismatch loss is inefficiency caused by the power that is not available to the load due to impedance mismatch and signal reflection. For 3:1, that is 1.25dB, so the total loss is 1.25dB + any cable loss.

I'm surprised that no-one else wrote in to complain. Or maybe not... - **Ed**.

W&S operating day

I went along to Waters & Stanton, ostensibly to help out with their operating day. Chris, G0IPU manned the CARS table and Murray, G6JYB represented ERG. TARG were there too and Essex CW Group in the guise of Steve, G4ZUL, Dave, G4AJY, Andy, G0IBN and Rob, M0KCP. The idea was to operate any of the W&S radios and get the feel for the equipment and antenna farm at their site. It was little advertised and very few people other were evident, which was a shame, as you don't often get that sort of chance. It was an interesting look at how amateur radio is changing.



Thinking about Andy's article on the previous page, CW is perhaps an ideal mode to use under these conditions where several rigs are being used close together and no-one needs to be yelling into a microphone. More than once headphones had to be used as the competing audio was playing havoc with readability so then you had a scenario where the hobby all looked very solitary.

Rob was working 2m with a huge linear that had three fans on top to keep it cool. The noise was quite obtrusive and comments were made that it wouldn't be very welcome in the shack at home. I had a look at the SunSDR MB1 while I was there. It was essentially just a PC with a SDR in it and dedicated controls.

The promo video looks good and it seems extremely comprehensive, but I found it completely unintuitive although user familiarity would solve that problem I guess. I also wondered about the noise level it would generate in the shack as it has four fans in the back panel. I once ordered a high end Rigol 'scope but had to send that back because I couldn't tolerate the fan noise and that is also the reason I sold on my IC-706. The TM-733 also had an irritating fan, but at least the one in my TS-570D never comes on in use.

Nothing's perfect, though, is it? - **Ed.**



Help wanted!

Colin, G0TRM and I responded to a circular email sent to committee and training team to help with a task at Danbury Village Hall. They have jumble sales there every week and the unsold stuff gets bagged and stuffed under the stage. Periodically, they then drag it all out and store it in the Hawkins Room where it awaits collection by rag merchants. I'm not sure why we were asked, as we pay our rent like any other room hirers, but this is what we did:



Barely room for a little 'un to stand under the stage!

Calling FT-817 owners

Or anyone else who can help with a problem. Vic, G4RAP lives in Writtle and is partially sighted. He wants to be put in touch with someone who can help him out with a problem. He lives in a first floor flat and has an Alex loop antenna, but he finds it difficult to see the buttons on his rig, so he would like help in setting it up for 40m.

If you are familiar with this rig, or if you think you can help by reading the manual and becoming so, then please let either me know via the editor's address on the front page or any Committee member, who will pass the message on to Vic. Thank you. - **Ed**.

Tailpiece

It's a new year and it's going to be a new way of doing things. When I took this job on I thought I might engender some enthusiasm amongst club members for submitting articles. I actually like doing this job. It's nice when people write in with comments - even when they tell me I'm doing it wrong; no one's perfect, not even me! That said, it's getting to be a bit of a strain. I have said before, three issues ago in an editorial, that the amount of copy I contribute will change. November's edition was a good one for me. I just had to push and pull a few pictures around and fit in something I had wanted to write about for a while. December's wasn't too bad, but this issue has been more of a problem. I have tried to cut my own content but the newsletter then looks very bare.

You, the readership tell me you like what you get. If so then, please, think about writing something. I only have to listen to the talk before meetings and during tea break to know people have a lot to say. Some people feel they can't contribute because they don't know how to format it. You don't have to. I will do that. It doesn't matter if you can't speel and/or your granma is atrocious. I don't care; I can sort it. I do it all the time and I don't get any complaints from those from contributors - yet. (Answers on a postcard, please!)

Give it some thought before the Newsletter withers. Please. - **Ed**.